Amendments to the Drawing:

The references to 124 have been changed on Figure 1 to 124a and 124b.

REMARKS/ARGUMENTS

In this, the first Action in the case, the Examiner objected to the disclosure and Abstract for informalities. In response, applicants have amended the specification and Abstract to cure the informalities. Withdrawal of the objection is therefore requested.

The Examiner also objected to the drawing for not showing reference labels 124a and 124b in Fig. 1. In response, applicants are submitting herewith a replacement drawing sheet of Fig. 1 showing the missing labels. Withdrawal of the objection to the drawing is therefore requested.

The Examiner rejected claims 6, 7-12, and 14 under 35 U.S.C. §112, second paragraph, for indefiniteness due to recitations of a capacitor having a resonant frequency. This rejection is respectfully traversed.

It is well known in the art that ideal capacitors exist only in text books, and that all practical capacitors have an inductance (and resistance). They thus behave similarly to a series RLC circuit, and have a resonant frequency below which they behave as capacitors and above which they behave as inductors. This resonant frequency is known as "self-resonance" (see, e.g., the attached eCircuit Center Capacitor Model). Applicants have therefore amended the specification and claims to refer to this resonant frequency as the "self-resonant frequency." In view thereof, applicants request that the Section 112, second paragraph, rejection of claims 6, 7-12, and 14 as amended be withdrawn.

Finally, the Examiner rejected claim 1 under 35 U.S.C. §102(b) over U.S. patent no. 6,211,754 (Nishida et al.) or U.S. patent no. 6,147,573 (Kumagai et al.), and rejected claims 1, 2, and 5 under 35 U.S.C. §102(b) over U.S. patent no. 6,094,112 (Goldberger et al.) In response, applicants have amended claim 1 to incorporate the recitation of claim 3, have added new claim 19 that is an independent version of claim 4, have added new claim 20 that is a version of claim 5 dependent

from claim 19, and have amended claims 2 and 3 to depend from claim 19. In view thereof, applicants request that the Section 102 (b) rejection of the claims as amended be withdrawn.

The Examiner's objections and rejections having been properly responded to, applicants suggest that the application is now in condition for allowance. Applicants therefore request that the application be reconsidered and thereafter be passed to issue.

Applicants believe the foregoing to be dispositive of all issues in the application. But, if the Examiner should deem that a telephone interview would advance the prosecution, applicants request the Examiner to contact their attorney at the telephone number listed below.

Respectfully submitted,

David Norte
Woong Yoon

By David Volejnicek

David Volejnicek
Corporate Counsel
Reg. No. 29355
303-538-4154

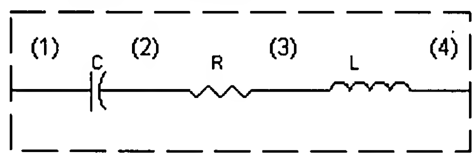
Date: 18 Sept. 2007

Avaya Inc.
Docket Administrator
307 Middletown-Lincroft Road
Room 1N-391
Lincroft, NJ 07738

Capacitor Model

CIRCUIT

CAPACITOR MODEL SUBCIRCUIT



CMODEL1.CIR Download the SPICE file

Ideal capacitors exist only in textbooks, not on real circuit boards. You may be surprised to find that all practical capacitors look (behave) similarly to the series RLC network shown above. Whether you're designing a filter or picking bypass capacitors, you'll need to know what your capacitor looks like across the entire frequency range. As you can imagine, having inductance in your filter at high frequencies where your intent was a capacitor, can produce some unexpected results.

REAL CAPACITORS

The reality of producing capacitors is in two parasitic components that come along with the package: inductance and resistance. External leads and internal paths create inductive and resistive parasitic components. So how does the real capacitor behave versus frequency? You can break down the behavior into three frequencies.

frequency	impedance
Low	Capacitive
Self-Resonance	Resistive
High	Inductive

At low frequencies, the capacitor's impedance looks just like you'd expect from the specified capacitor value. At self-resonance, the capacitive and inductive impedances cancel each other out leaving only a resistive component. The self resonance is given by

$$fo = \frac{1}{2\pi\sqrt{LC}}$$

The resistive component is usually referred to as the Equivalent Series Resistor (ESR). Above self-resonance, the inductive reactance takes over as it grows much larger than the capacitive reactance and ESR.

CAPACITOR SPICE MODEL

What values of C, L and R do you choose to create the capacitor model? The table below shows you how to assign values.

component	*value*
C	Capacitance
R	ESR
L	$L = 1/[(2\pi\ fo)^2 \times C]$ where fo is the self-resonant frequency

The capacitance value comes right from its specified value. The **ESR** and self-resonant frequency **fo** are usually available from the manufacturer's web site or by request.

Let's create capacitor models for 1 uF and 0.1 uF capacitors. For a 1 uF capacitor, ESR = 0.03 ohms, fo = 1 MHz and we calculate L = 25.3 nH. Similarly, for the 0.1 uF capacitor, ESR = 0.08 ohms, fo = 10 MHz and we calculate L = 2.53 nH.

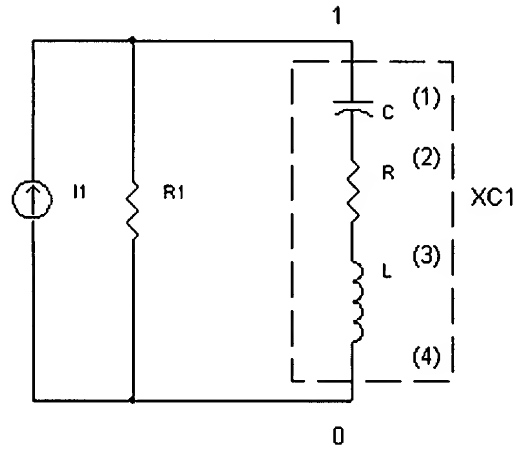
It's convenient to create a subcircuit for the three elements of the capacitor. Why? This makes it easy to insert the model into a new or existing circuit. (See Why Use Subcircuits?) For the 1 uF capacitor, the subcircuit call and definition are shown below.

```
XC1 1 0 C105            ;subcircuit inserted at nodes 1 and 0

.SUBCKT C105 1 4        ;subcircuit definition
* FO = 1 MHZ
C 1 2 1UF
R 2 3 0.03OHMS
L 3 4 25.3NH
.ENDS
```

CAPACITOR IMPEDANCE VS FREQUENCY

How do you plot the impedance of a network? One trick is to drive the network with a 1A RMS current source and then plot the voltage across the network. This works because the voltage is equal to the impedance under these conditions (V = Z x I = Z x 1 = Z).



CIRCUIT INSIGHT Run a simulation of the SPICE file CMODEL1.CIR. Look at the the impedance of the 1 uF model (C105) by plotting VM(1). Change the Y-axis to a log scale to get a better view. If this were an ideal capacitor, what would you see? The impedance would get smaller as frequency increases Xc = 1/(2π x C x f). However, the impedance of this model takes a dip at self-resonance and then starts **increasing** with frequency! The inductive impedance takes over (Xl = 2π x L x f) . This may produce disappointing results if this capacitor is chosen for a filter operating at frequencies near or above its self-resonance.

How do we know the impedance is capacitive and inductive at frequencies below and above self-resonance? Plot the phase shift of the network by adding a new plot window and adding trace VP(1). Negative and positive phase indicate capacitive and inductive reactances, respectively.

IMPEDANCE VS. CAPACITOR SIZE

CIRCUIT INSIGHT For a given capacitor type, what happens to the self-resonant frequency for smaller capacitor values? Plot the impedance of a 0.1uF capacitor (C104) by adding trace VM (2). The self-resonance is higher making this capacitor more useful at higher frequencies. To see these models in action, check out Power Supply Bypassing.

CAPACITOR NOTES

These subcircuits model a capacitor's self-resonant and series resistive behavior. More complex models can be created that mimic other non-ideal behaviors such as dielectric absorption, leakage and temperature effects. Some capacitor manufacturers provide SPICE models that include these effects.

SIMULATION NOTE

You may have noticed R1 = 100MEG to ground across the capacitor model. What's the purpose of this component if it has little effect on the impedance? The problem is that without R1, node 1 has no resistive path to ground; SPICE is not happy under these conditions and may grind to a

halt. The 100MEG resistor solves the problem by providing a DC path to ground.

SPICE FILE

Download the file or copy this netlist into a text file with the *.cir extention.

```
CMODEL.CIR - CAPACITOR MODEL
*
* MEASURE IMPEDANCE OF CAPACITORS USING 1A CURRENT SOURCES
I1      0       1       AC      1
XC1     1       0       C105
R1      1       0       100MEG
*
I2      0       2       AC      1
XC2     2       0       C104
R2      2       0       100MEG
*
* 1 UF CAPACITOR MODEL - INCLUDES ESR AND SELF-RESONANCE
.SUBCKT C105            1    4
* FO = 1 MEG HZ
C       1       2       1UF
R       2       3       0.03OHMS
L       3       4       25.3NH
.ENDS
*
* 0.1 UF CAPACITOR MODEL - INCLUDES ESR AND SELF-RESONANCE
.SUBCKT C104            1    4
* FO = 10 MHZ
C       1       2       0.1UF
R       2       3       0.08OHMS
L       3       4       2.53NH
.ENDS
*
* ANALYSIS
.AC     DEC 40  10K 100MEG
* VIEW RESULTS
.PRINT AC       VM(1)  VP(1)
.PLOT   AC      VM(1)  VP(1)
.PROBE
.END
```

top